

## Waite's Blind Snakes (Squamata: Scolecophidia: Typhlopidae): Identification of Sources and Correction of Errors

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**ABSTRACT.** The majority of the 542 typhlopoid specimens examined by Edgar Waite for his 1918 monograph of the family are identified, and their current status discussed. Most Waite records that do not correspond with the distribution based on modern records are shown to be in error, involving either misidentifications, misreadings of localities, or transposition of data. A few remaining problematic records are considered dubious due to a lack of supporting data.

*Ramphotyphlops batillus* (Waite, 1894), known only from the holotype from Wagga Wagga, NSW, is restored to the Australian fauna, and new data on the type are provided.

Probable paratypes for *Typhlops grypus* (SAM R849; QM J2947), *T. proximus* (AM R615, R145401–07, SAM R915) and *T. subocularis* (AM R2169) are identified. New data on dorsal scale counts are provided for *Ramphotyphlops leucoproctus* (377–394), *R. polygrammicus* (370–422), *R. proximus* (326–392), *R. wiedii* (381–439) and *R. yirrikalae* (447–450).

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Although a number of species of Australian typhlopoid snakes had been described by European herpetologists in the nineteenth century, notably Wilhelm Peters and George Boulenger, it was the publications of Edgar Ravenswood Waite (Waite, 1893, 1894, 1897a,b, 1898, 1917, 1918a), culminating in a revision of the family in Australia (Waite, 1918b), that provided the basis of knowledge of the Australian typhlopoid fauna. In the 80 years since Waite's final revision, despite several new species being described (Parker, 1931; Kinghorn, 1929a, 1942; Loveridge, 1945; Robb, 1972; Storr, 1983, 1984; Ingram & Covacevich, 1993; Aplin & Donnellan, 1993; Shea & Horner, 1997; Aplin, 1998; Couper *et al.*, 1998) only one significant revision of Australian typhlopids has appeared (Storr, 1981). Waite's

work, particularly his key, distribution maps and figures, has been the main source of much of the subsequent literature on Australian typhlopids.

Waite's typhlopoid work set new standards for Australian herpetology by attempting to use all available material, not just the specimens available in a single institution. Despite this use of large amounts of material from diverse sources to derive his distribution maps, he provided precise locality data for few specimens, and cited museum numbers only for primary type specimens he had described. Many of the species were known from only a few specimens, from widely separated localities. Distribution maps and statements derived from these initial mapping efforts have often joined these widely-spaced sites to produce broad,

almost Australia-wide distributions for many species (Kinghorn, 1929b, 1956; Worrell, 1963; Cogger, 1975; Wilson & Knowles, 1988; Gow, 1989; Hoser, 1989; Mirtschin & Davis, 1992) that have not been supported by subsequent workers using modern material (Storr, 1981; Swan, 1990; Ingram & Raven, 1991; Ingram & Covacevich, 1993; Shea, 1995; Shea & Horner, 1997).

This paper is the result of a search of early Australian museum collections and registers to attempt to identify the basis for Waite's typhlopoid distribution records, particularly those that are well outside distributions as currently known, with the aim of reconciling these anomalies. In the course of this work, new data on morphological variation became available for several poorly-known species, and are presented herein.

Waite (1918b: 1) reported examining 542 specimens in the following collections: the Australian Museum, Sydney; Macleay Museum, Sydney; National Museum of Victoria, Melbourne; Queensland Museum, Brisbane; South Australian Museum, Adelaide, and Western Australian Museum, Perth. The status of pre-1918 collections in each institution is documented below, for the purposes of identifying the material available to Waite.

**1. Australian Museum (AM).** Registration of the herpetological collections in the Australian Museum began about 1877, with a specific herpetology register beginning in 1886 (Cogger, 1979; Shea & Sadlier, 1999). Waite arrived in Australia in 1892 to take up a post at the Australian Museum. He resigned from this position in March 1906 to go to the Canterbury Museum in New Zealand, and in April 1914 became Director of the South Australian Museum (Cogger, 1979; Hale, 1928; Jones, 1992, 1995; Tyler & Hutchinson, 1993). Waite's early work on typhlopids was undertaken during his tenure at the Australian Museum, and seems to be largely based on Australian Museum material (Waite, 1893). Large numbers of typhlopids were registered during the period of Waite's employment, and he actively solicited material (Waite, 1893).

Many typhlopoid records in the Australian Museum registers are stamped in blue ink "identified by Waite 1918", and these stamped entries end with a number of previously unregistered typhlopids registered as a block (R6554–88) in January, 1914. However, these identifications do not include all the typhlopids examined by Waite, as there are a number of specimens not so identified which uniquely fit localities given by Waite (1918b). Only two typhlopids were registered between R6588 and the end of 1918. Neither can be unequivocally identified as examined by Waite, although one AM R6716, *R. ligatus* (Lightning Ridge) does not correspond to a map locality (but see comments below, under *ligatus*). Hence, it is assumed that R6588 marks the end of the typhlopids available to Waite.

Determination of which pre-1918 typhlopids were identified by Waite is difficult because a number of specimens were exchanged with other institutions prior to 1918, and a number of specimens were destroyed in February 1914 due to poor condition. A large collection was exchanged to the Museum of Comparative Zoology in 1914, where they were reported on by Loveridge (1934).

Some of these were registered pre-1906, and would have been available to Waite while he was at the Australian Museum. However, none of the unique localities associated with these specimens correspond to map localities from Waite (1918b), and I assume that Waite's maps are derived only from specimens examined subsequent to his return to Australia. Even with the removal of these records, there are a number of specimens that cannot be confirmed as examined by Waite, as they have imprecise locality data which would not have been mapped, or come from regions well represented in collections, where one dot on a map would suffice for a number of specimens.

**2. Macleay Museum (MM).** The Macleay Museum at the University of Sydney has had a chequered history. The basis for the collection is the private collections gathered by three members of the Macleay family, particularly William John Macleay. The "Macleayan Collection" was donated to the University of Sydney in 1890, just before W.J. Macleay's death in 1891, with the requirement that it be curated by Macleay's curator, George Masters. Following Masters' death in 1912, the collection was poorly maintained for over fifty years, and a number of specimens were damaged, destroyed or lost associated data (Stanbury & Holland, 1988; Horning, 1994). No registration of herpetological specimens was undertaken until S.J. Copland began a personal registration system of numbers tied to specimens in the 1940s (Copland, 1946). In 1965, the curator of the Macleay Museum, Ms Jenny Anderson, began a register with a new system of numbering for all specimens in the herpetological collections (Goldman *et al.*, 1969). Thus some, but not all, specimens in the collection have two numbers, a formal registration number and a Copland number. Prior to registration, data for specimens was in the form of loose labels in or on the bottles containing specimens, and these labels have generally been retained with the specimens.

Waite studied the Macleay Museum collection in 1893 (Waite, 1893) and described one species from it in the following year (Waite, 1894), during his time in Sydney. Hand-written paper labels in most typhlopoid bottles give identifications with Waite's initials in pencil, indicating his examination of these specimens. A few other bottles, although lacking these initialed labels, have similar labels with numbers up to 18, and probably represent the material loaned to Waite. The few typhlopids which lack both labels either lack all data, or are identifiable as later additions to the collection.

Curiously, although several typhlopids come from localities (King Sound, Darnley I., Cape Grenville) for which Macleay reported reptile collections (Macleay, 1877, 1888), he did not mention typhlopids in these papers.

**3. Museum of Victoria (MV).** Three systems of registration have been employed for the herpetological collections at the Museum of Victoria (J. Coventry, pers. comm.). Early specimens were identified by unprefixed numbers in a system employed for the entire museum collection that probably commenced in 1854, and was used until about 1940. A second system with R-prefix, for all vertebrate specimens, began in the early part of the twentieth century,

prior to the present D-prefixed herpetological registration system, which commenced in 1933. Many of the early unprefixed and some of the R-prefixed numbers have been reregistered into the modern system. Waite did not report receiving typhlopids from the Museum of Victoria during his period in Sydney, although he did communicate with Frederick McCoy, the director, concerning typhlopids at this time (Waite, 1893). It is probable that he first received the Museum of Victoria typhlopid collections for study at the South Australian Museum following his return to Australia in 1914. A list of the MV specimens sent to Waite, together with his identifications of them, is contained in correspondence from Waite to Museum of Victoria dated 14.v.1918 (Coventry, 1970). The specimens examined fall into three series: R3080–81 (two specimens), R7055–147 (90 specimens) and R7165–204 (37 specimens). Dating these specimens is difficult. A column of dates in the register appears to be dates of receipt of the specimens, based on their arrangement. Not all specimens have dates, and the dates available are not in order, but grouped by collector or donor, regardless of locality. Thus, the date 1.viii.1908 is used for the series R7172–204, all received from the Western Australian Museum, with a range of localities, some localities with a second date, between 1896 and 1898. The latest date of receipt associated with these series is 26.iii.1917, for R7067, suggesting that the specimens were registered in 1917, probably as a block just prior to sending them to Waite.

**4. Queensland Museum (QM).** A separate register for the Queensland Museum herpetological collections did not commence until 1911, prior to which a complex system of separate donor, accession, purchase, exchange and collection registers was used for the entire museum collection (Covacevich, 1971). Waite reported examining the entire typhlopid collection between 1893 and 1894 (Waite, 1893, 1894), describing a new species from the material. He subsequently examined material registered post-1911, many of the registration entries in the modern system noting that the specimen was identified by Waite. Registration numbers were not consistently available for the early material, which was slowly incorporated into the modern system, some material being incorporated as recently as 1970 (Covacevich, 1971). Hence, it is not possible to fully identify the Queensland Museum material examined by Waite on the basis of registration data. However, as the material was loaned to Waite, it can be assumed that it would have been registered prior to sending it. Hence, typhlopids registered pre-1918 are likely to have been examined by Waite. The typhlopids registered pre-1918 include a large block of consecutively numbered specimens (J2935–54) from a variety of sources, registered between 29.v–2.vi.1917 and definitely including material seen by Waite on the basis of unique localities. The next typhlopid entries are a block of three specimens, J3004–06, registered 4.viii.1917, two of which are annotated as examined by Waite, and the last one of which also uniquely fits a Waite record. Then follow six typhlopids registered on three occasions between 6.ix.1917 and 22.iii.1918, none of which are annotated as examined by Waite, and for which

the few localities do not correspond to Waite's maps. Hence, it is assumed that J3006 is the most recent specimen seen by Waite. It seems that not all typhlopids registered prior to this specimen were sent to Waite, as there are several unique records which do not appear in Waite's monograph. Further, only some typhlopid entries, even among series, are annotated as examined by Waite. Conversely, such annotations are not made for all specimens seen by Waite, as a few unique records corresponding to Waite's monograph are not so annotated.

**5. South Australian Museum (SAM).** On Waite's return to Australia from New Zealand in 1914, he became Director of the South Australian Museum. It seems his interest in Australian typhlopids was rekindled on his return with access to an extensive new collection (Waite, 1918b: 1). His 1918 typhlopid monograph was the first paper in the new "Records of the South Australian Museum", which he had initiated (Jones, 1995), and may have been hastily prepared to meet publication deadlines. Permission for the publication of the new journal was given on 18 September, 1917, and in the nine months before the publication of the first issue on 24 June 1918, he was heavily involved in planning the new publication in addition to his usual administrative work. In the final six weeks before publication, he was also planning for an expedition to New Guinea, leaving on the day of publication of the journal (Jones, 1995).

Registration of South Australian Museum herpetology collections began in 1911, with a large backlog of typhlopid material registered as a block (R802–R862) on 11.i.1918, probably indicating the completion of registration of material used for his monograph. A second block of typhlopids (R914–927) was registered on 3.x.1918, after the publication of his monograph, and consists of material received in exchange or by donation from other museums, and known to have been used by Waite in his monograph, together with some "old collection" specimens that do not correspond to localities in his monograph, and were presumably located after completion of the work.

**6. Western Australian Museum (WAM).** Although the Western Australian Museum was founded in 1892, registration of herpetological collections did not begin until 1912. Waite did not report examining material from the Western Australian Museum in his early papers, and probably borrowed the typhlopid collections to examine in Adelaide on his return to Australia. Early typhlopid registrations in this system, up to R630, registered May 1917, are mostly annotated as seen by Waite (either "identified" or previous identification "confirmed"). The few exceptions are generally either annotated "useless", and represent specimens disposed of at the time of registration, or do not correspond to Waite's localities, and hence were probably found in the collection after the loan was sent to Waite.



### Waite's typhlopids records

For the purposes of conformity to Waite's papers, the species are listed as in their original combinations, although all Australian species are now placed in the genus *Ramphotyphlops* (Robb, 1966). In addition to the acronyms given above for Australian museum collections, the following acronyms are used: AMNH, American Museum of Natural History, New York; BMNH, Natural History Museum, London; CAS, Californian Academy of Sciences, San Francisco; MCZ, Museum of Comparative Zoology, Harvard; NHRM, Naturhistoriska Riksmuseet, Stockholm; PNM, Philippine National Museum, Manila.

Dorsal scale counts are along the dorsal median scale row, from the first scale caudal to the rostral, to the scale immediately cranial to the terminal spine.

*Typhlops affinis*: Waite (1918b) reported examining only three specimens. One of these was from north Queensland, one from Eidsvold, and one from Campbelltown. The latter two localities are mapped, together with a literature record from Lönnberg & Andersson (1913) from Mallallah in the Kimberley. Modern records indicate a distribution only from central Queensland (Ingram & Raven, 1991) south to central-north NSW (the only definite NSW records being AM R16759, Mungindi; R135419, 6.5km NE "Karalee", NE of Enngonia, and R142984, 9km E "Beulah") in semi-arid habitats.

The Mallallah record is based on NHRM 2398, here reidentified as *R. grypus*. The specimen has 647 dorsal scales, dark head and tail, a hooked snout and the nasal cleft from the second supralabial. The Campbelltown record is probably based on AM R2422, a specimen of *R. affinis* with no locality, but with the previous registration number given the locality Campbelltown.

The only Waite localities supported by modern records are Eidsvold and north Queensland. Three early specimens correspond to the former record: AM R5333, R6343a–b (all from Eidsvold, donated T.L. Bancroft). The latter two specimens are identified in pencil in the original register as "nr *wiedii*, 18 scales, nasal cleft not on snout", suggesting uncertainty about their identification, and hence R5333 is probably the basis for the Eidsvold record. Waite's north Queensland specimen is MV R7055. One additional specimen of this species, AM R2722 (no locality) is recorded as identified by Waite in the registers, while another early AM specimen, R153041 (formerly 6426) (Gayndah) may have been overlooked by Waite.

*Typhlops australis*: Waite (1918b) maps two localities in the Northern Territory, well beyond the otherwise nearly continuous distribution in southern Australia. These are probably based on two "central Australian" localities listed by Waite: Fraser Range and McMinn's Creek. However, Fraser Range is in Western Australia, this record being based on AM R6583 (Fraser Range; Elder Expedition), the specimen identified as *Typhlops* sp. by Stirling & Zeitz (1893). The identification of this specimen is confirmed as *R. australis*. The McMinn's Ck locality is based on SAM R805 (McMinn's Ck,

McDonnell Ranges, don. Illamurta Police Station), originally identified as *T. australis*, but which is now identified as *R. endoterus* (M. Hutchinson, pers. comm.).

Waite's map also has a locality for *R. australis* north of the Kalgoorlie area, well beyond recent records from Western Australia. This corresponds with a specimen, AM R3375, from Laverton (H.P. Richards). This juvenile specimen is confirmed as *R. australis*, and has 308 dorsal scales.

The third significant outlying locality on Waite's map is his only record for NSW, a dot in the vicinity of Wagga Wagga. However, a single specimen (AM R1197, Narrandera, J.A. Morris) was in the Australian Museum collection during Waite's period in Sydney, and the dot may be misplaced on the map.

Other map localities, within the known modern range (Storr, 1981; White, 1981; Swan, 1990; Coventry & Robertson, 1991), correspond to the following early records. From the Western Australian Goldfields, the three dots correspond to AM R3365, Boulder, AM R2172, SAM R172, Kalgoorlie and QM J119 (ex AM), J2951, Coolgardie, with an additional poorly localised specimen, WAM R27 (Goldfields), known to have been seen by Waite.

The five south-western Western Australian dots on Waite's map correspond to the following specimens of *R. australis*, of which the MV, SAM and WAM specimens were identified as such by Waite: AM R2372 (destroyed 1965), R2440–41, Perth; AM R2985, Harvey agricultural area, 80 mi. S Perth; MV R7181, Chidlow's Well; R7188–89, Mortlock, Perth (1898); R7191, Mandurah (1897); R7194, Perth (1898) (the latter five specimens received from WAM, presumably prior to the initiation of the modern registration system); SAM R859, Bunbury; WAM R212, Meckering; R456, Muchea and R620, Beechboro, with the Perth, Chidlow's Well, Mortlock, Mandurah and Beechboro specimens represented by a single dot (Waite, 1918b: 14). Additional specimens of *R. australis* available to Waite from this region were identified by him as *R. wiedii* (see below).

It has been possible to match specimens to most of Waite's South Australian localities, but not to all. The exceptions are among a number of dots along the coastal plain north of Adelaide, and two dots close to the Victorian border. Specimens which match mapped localities (including Adelaide suburban localities represented by a single dot; Waite, 1918b: 14) are: AM R131183 (formerly 6425), SAM R813, Pt Lincoln; MV R7063, Franklin Harbour; SAM R9, Tanunda and Murray Flats; R63, Salisbury; R281a–b, Eden Hills; R286, R439, Purnong; R299, Sleeps Hill; R393, Quorn; R411, Mulgundawa; R436, Mitcham; R478, Renmark; R480, Cleve; R627, Monarto South; R774, Wirrabara; R782, Angaston; R788, Loxton (now missing); R790, Karoonda; R806, Athelstone; R807, Orroroo; R808, Kapunda; R809, Emu Flat; R810, Lyndoch Valley; R812a–b, Stony Ck, Willowie Forest; R814, Nuccaleena; R815, Kapunda (now missing); R816, Laura; R817, Denial Bay; R818, Tea Tree Gully; R819, Edithburg (now missing); R820, Cowell; R821, Stockport; R822, Highbury; R825, Tanunda (now missing); R826, Punyelroo; R855, Tailum Bend; R856, Waterfall Gully; R857a–b, Fowlers Bay; R858, Paratoo; R860, Stonyfell; R861, Strathalbyn; R867a–b, Ooldea.



The three Victorian localities correspond to MV R7109, Beulah; R7125, Mallee; R7165, Mallee district, and R7131–36, Ouyen.

Additional unlocalised or poorly-localised specimens known to have been seen by Waite or available in collections at the time are AM R4978–80, MV R7176, R7185, R7192, R7197, R7202–03 (all ex WAM), WA; AM R6556 (exchanged to PNM in 1950), MV R7094, R7116, QM J2952, SAM R863, WAM R359, R629, no locality; AM R6557–58, R131180 (formerly 6393), R131181 (formerly 6416), R131182 (formerly 6422), SAM R724, R824, SA; R811, Murray Scrub, SA.

AM R6557–58 are very large adults with angulate snouts, labelled by Waite “*T. bicolor*, snout sharp-edged; put aside for comparison” (see also Waite, 1897a). Similarly angulate snouts are characteristic of large eastern Australian specimens, and appear to be an ontogenetic development, as they are absent in small individuals, while larger individuals have progressively more angulate snouts. In contrast, the nominotypic population of *R. australis* usually has a rounded snout at all growth stages (Storr, 1981).

*Typhlops batillus*: This species was described by Waite (1894) from a unique specimen with locality Wagga Wagga in the Macleay Museum collection. The holotype, later registered as MM R669, was transferred to the Australian Museum on permanent loan, where it is registered as R42756 (Cogger, 1979). The species was listed as distinct by Waite (1918b), Kinghorn (1929b, 1956) and Worrell (1963), none of whom reported additional material. McDowell (1974), when revising the New Guinean and Solomon Islands typhlopid fauna, examined the holotype because of a general similarity in head shape with Solomons species *R. subocularis* (Waite, 1897b), subsequently referred to the genus *Acutotyphlops* (Wallach, 1995). McDowell reported that the head was not as distinctly pointed as in Waite's (1918b) illustration, and that the holotype was female and possessed a rectal caecum. Cogger (1975 and subsequent editions) did not list the species among the Australian herpetofauna, misinterpreting McDowell's comments as suggesting that the species was not Australian (H.G. Cogger, pers. comm.). Cogger *et al.* (1983) regarded the type locality as suspect. Cogger's exclusion of the species from the Australian herpetofauna was followed by most subsequent authors (Wilson & Knowles, 1988; Swan, 1990; Weigel, 1990; Ehmann, 1992), although it was regarded as a distinct species from New South Wales by Welch (1994).

Because the holotype is female, it is not possible to definitely assign it to *Ramphotyphlops*, the genus to which all other Australian typhlopids belong, and because of the possibility that the type locality is erroneous, it is necessary to extend comparisons with other species internationally. The Macleay Museum collection contains non-Australian reptile material, including typhlopids.

I have examined the holotype of *T. batillus* and compared it to descriptions of all other typhlopid species (as listed by Hahn, 1980; Welch, 1994, with additions by Auffenberg, 1980; Rodrigues, 1991, Wallach, 1993a, 1994). In addition to the features described by Waite (1894, 1918b) and

McDowell (1974), it has 557 dorsal scales, the second supralabial overlapped by the preocular, 21 subcaudal scales, and only a single elongate postocular scale. The longitudinal scales rows are 26 anteriorly (at level of 44th dorsal), reduced to 24 by the 200th dorsal, and to 22 just anterior to the vent. The eye is prominent and has an obvious pupil. Scale organs are abundantly present on the rostral, nasal, ocular, and preocular, and fewer on the frontal, supraocular, parietal, interparietal, postocular, supralabials, infralabials and some chin shields, while obvious glands are lacking along the margins of the head shields.

The species does not agree with the diagnoses of the genera *Acutotyphlops*, *Cyclotyphlops*, *Rhinotyphlops* or *Xenotyphlops* (in den Bosch & Ineich, 1994; Wallach, 1994, 1995; Wallach & Ineich, 1996).

Among the species of *Ramphotyphlops*, with which it shares a T-III supralabial imbrication pattern (Wallach, 1993a,b), with the second supralabial overlapped by the preocular, it shares 24 midbody scales only with *R. acuticaudus*, *R. cumingii* and *R. lineatus* in Asia and the Pacific, and *R. ligatus*, *R. unguistrostris* and *R. yirrikalae* in Australia. The three non-Australian species have fewer dorsal scales (maximum 497 for *R. cumingii*; Wallach, 1994), while all three Australian species have the nasal cleft contacting the first infralabial (*vs* second). Additionally, *R. ligatus* has fewer transverse scale rows (ventral scales up to 435; Storr, 1981) and a nasal cleft that extends parallel to the rostral well onto the dorsal surface of the head (*vs* passing medially from nostril to contact rostral, barely visible from above), *R. unguistrostris* has fewer transverse scale rows (ventral scales up to 474; Storr, 1981) and an angulate snout profile, and *R. yirrikalae* has fewer dorsal scales (447–450 in the holotype and AM R12889) and a broader rostral.

Comparison with the numerous *Typhlops* species is made on a geographic basis. None of the African or European species possess the combination of a T-III supralabial imbrication, 24 midbody scales and 557 dorsal scales (Roux-Estève, 1974; Grillitsch & Grillitsch, 1993).

None of the South American species have 24 midbody scales (Peters & Orejas-Miranda, 1970; Dixon & Hendricks, 1979; Rodrigues, 1991). Although two species of Caribbean typhlopids have 24 midbody scales as a mode or occasional variant (Thomas, 1989), they also either have a posterior reduction to 22 rows of body scales well forwards of the vent and a short tail (*T. biminienensis*, Thomas, 1968), or a preocular with a strong anterior projection into the nasal, the third supralabial contacting the nasal and fewer dorsal scales (*T. dominicanus* Richmond, 1966).

Among the Malagasy and Comoran typhlopids, only *T. mucronatus* has both 24 midbody scales and a distinct eye (Guibé, 1958; Roux-Estève, 1980), and this species differs from *R. batillus* in having the nasal cleft contacting the first supralabial, and the tail as wide as long (Boettger, 1881).

Among the Asian species, only *T. bothriorhynchus*, *T. depressiceps*, *T. diardi*, *T. hypogius*, *T. klemmeri*, *T. kraali*, *T. oatesi*, *T. trangensis* and *T. wilsoni* have 24 midbody scales (Wall, 1908; Taylor, 1962; McDowell, 1974; Savage, 1950; Wynn & Leviton, 1993; Wallach, 1993a, 1994). All of these except the poorly-known *T. wilsoni* differ from *R.*

*batillus* in one or more of the following characters: dorsal scales fewer than 400, a T-V supralabial imbrication pattern, and snout profile rounded (McDowell, 1974; Wallach, 1994). As originally described, *T. wilsoni* differs from *R. batillus* in having a distinct subocular scale between ocular and supralabial (Wall, 1908).

Hence, *T. batillus* is distinct from all other described typhlopoid species. Although it can not unequivocally be placed in *Ramphotyphlops*, it is most similar to that genus in the supralabial imbrication pattern. The only reported locality, Wagga Wagga, is not inconsistent with the Macleay collection history. William John Macleay was a grazier in the Riverina, owning “Kerarbury” Station, and a vineyard at Wagga Wagga. Further, he was known to have made at least one collecting trip to Wagga Wagga with his collector and curator, George Masters, in January 1874 (Fletcher, 1893; Stanbury & Holland, 1988; Horning, 1994). In the absence of any evidence to the contrary, *R. batillus* should be reinstated as a member of the Australian herpetofauna, known only from a single locality. The lack of any recent records from this district, despite herpetological collections over a number of years (Annable, 1995) is disturbing, and the conservation status of this species should be urgently evaluated.

*Typhlops bituberculatus*: Waite’s (1918b) map differs from modern distribution maps for the species (White, 1981; Storr, 1981; Swan, 1990; Ingram & Raven, 1991) in the inclusion of records from Bundaberg, Qld, Barrow Creek, NT, eastern NSW (a dot placed about Katoomba), Fortescue River, WA, central WA (a dot placed about Lawler), and south-western WA (five dots).

The Bundaberg record is probably based on MM R444 (Bundaberg, no other data), which is confirmed as *R. bituberculatus*. The specimen is a juvenile in very poor condition. As this species is not otherwise known from eastern Queensland, with the nearest records in south-central Qld (Ingram & Raven, 1991), the record is regarded as suspect.

The Barrow Creek record is presumably based on SAM R830 (Barrows Creek, no collector, old collection), the identity of which is confirmed as *R. bituberculatus*. This specimen has about 490 dorsal scales (M. Hutchinson, pers. comm.). There are no other confirmed records of this species from the same latitude or further north, and the record should be treated as suspect.

Four of the five dots in south-western WA correspond closely to early typhlopoid records subsequently reidentified (Storr, 1981) as *R. waitii*, a superficially similar species sharing a trilobed snout, 20 midbody scales and a nasal cleft proceeding from the second supralabial and which Waite was unable to identify from Boulenger’s (1895) description: MV R7199, Bullsbrook (ex WAM); MV R7172, R7193, Cranbrook (ex WAM); WAM R403, Carnamah; WAM R421, Williams. The remaining locality, from the coast, may be based on AM R2429, Perth (presented by W.D. Campbell), here confirmed as *R. bituberculatus* (501 dorsal scales, 485 ventral scales, rostral not with a hooked margin), MV R7183–84, R7196, Perth, and R7190, Mortlock, Perth. Of the latter four specimens, all ex WAM and identified by Waite as *T. bituberculatus* (J. Coventry, pers. comm.), R7196 is now identified as *R. waitii*, while the remaining three

specimens are confirmed as *R. bituberculatus* (G. Storr, *in litt.* to J. Coventry, pers. comm.). The locality for R2429 presumably represents a shipping point or is in error, as other reptile collections presented by Campbell either have the locality Perth but include inland species, or have the locality Boulder. The central WA record is probably based on AM R3355 (now AMNH 20942), Lawler (pre: G. Shipton). The Fortescue River record is probably based on SAM R220 (Fortescue River, W.D. Dodd), although that specimen is apparently lost. The record is within the range of *R. waitii* (Storr, 1981), and is presumed to be based on that species. The remaining WA locality, within the known modern range of the species (Storr, 1981), is probably based on AM R153051 (formerly part of R1693), Coolgardie, together with two poorly localised specimens, WAM R26, R448 (“Goldfields”).

The basis for the eastern NSW locality remains difficult to determine. There are two records of *R. bituberculatus* from eastern NSW, although neither fit the mapped locality precisely. AM R64, Callan Park (a Sydney locality), was originally identified as *Pygopus lepidopodus*, but subsequently reidentified as *R. bituberculatus* in Waite’s handwriting. This record is rejected, due to the lack of confirmatory records from east of the Great Dividing Range and the potential for association of the wrong specimen with the tag suggested by the change in identification. The second record is AM R131179 (formerly A2475), from Mr Walter Blaxland’s Station, the identification being initialled by Waite. The collection of which this specimen is part is annotated in the original register with what appears to read “Cullingral, Merriwa”.

Identifiable specimens corresponding to most of Waite’s other NSW dots are: AM R1693, Dubbo; R2723, Broken Hill; R1176, Menindee; R3551, Narrandera; R3640, Lake Cargelligo; R4259 (now AMNH 20948), Shuttleton; R4403, N Broken Hill; R5109–10, Corella, nr Brewarrina; MM R670, Wilcannia; R671, Coonabarabran; SAM R831a–h, Silverton; MV R7071, Jerilderie and MV R7086, Deniliquin. One specimen with a precise locality, AM R1448, Tocumwal, does not appear on his 1918 map.

The ten Victorian localities, all within the modern range, correspond in part to the following specimens: MV R7060, “Bathry” Stn, Terricks; R7065, R7126–33, R7137, Ouyen; R7076, Beulah; R7078, Mallee; R7085, Gunbower; R7092, Myall, via Koondrook; R7100, near Gerang; R7106, Nhili; R7138–43, Woomelang, although one specimen seen by Waite, MV R7083, Goulburn Valley, is not mapped, I have been unable to identify the locality for another (R7064, Cashel), and the southernmost locality cannot be related to a specimen.

South Australian records corresponding to Waite’s map localities are: SAM R541, R832–34 (R834 now missing), Murray Bridge; R547, Yorke Peninsula; R617, Kadina; R630 (now missing), Streaky Bay; R646 (now missing), Quorn; R656, Modbury; R667, 408 Mile, East-West Line; R813, Pt Lincoln; R828, Kopperamanna, Coopers Ck; R829 (now missing), Semaphore; R834a–b, Purnong; R835, Ardrossan; R836 (now missing), Denial Bay; R837, Roseworthy; R839a–b, Leigh Creek; R840, Oodlawirra; R841, Kadina; R842, Yudnamutana; R843a–b (now missing), Orroroo; R844, Kapunda; R845, Pt Pirie; R846a–



e, between Ooldea and Talarinna (only a–c now present); R847, Kilalpaninna; R887 (now missing), Reedbeds. One SA specimen available to Waite, but not mapped is SAM R540, Pernatty Lagoon. Waite localities for which specimens are not identifiable include several peripheral localities in a cluster about Adelaide and the Murray region to the east, and the two north-easternmost localities in the state, one of which probably corresponds to Strzelecki Ck (Waite, 1917).

Additional to these are the following poorly-localised specimens of the same vintage: AM 6418 (not found), R1917, R6559, R131171–73 (formerly 5180), R131174 (formerly 6406), R131175–78 (formerly 6417, 6419–20, 6423), MV 7099, SAM R848 (36 specimens, destroyed 1965), no locality; AM R1451 (7 specimens), Darling River floods; R5027, MM R672–73, QM J1914 (formerly AM R1567), NSW; AM R6585, interior of NSW?; R131175–78 (previously 6417, 6419–20, 6423), SAM R217, R301, SA; MV R7103, Vic; R7204, WA; SAM R838a–e, Murray Scrub, SA.

One specimen potentially available to Waite does not correspond to a map locality: QM J1915, Roma, Qld. The registration entry for this specimen is annotated “on exhibit, removed 1954”, and it was presumably not sent to Waite.

*Typhlops broomi*: Waite (1918b) reported examining five specimens, and gave the localities Cairns, Norseman, Broome and Mallee, Vic., the latter three well outside the known modern range (Ingram & Covacevich, 1993; Shea, 1995). The Cairns locality is probably based on SAM R851, Cairns (A.M. Lea, old collection, registered 11.i.1918). The Broome record is based on a specimen of *R. diversus*, SAM R925 (previously MV R7182, itself received from WAM) from Rowe, Broome, initially identified as *R. broomi*. The Norseman record is based on MV R7066, identified by Waite as *R. broomi*, but reidentified as *R. australis* (Storr, 1981). The fourth locality, “Mallee, Vic.” is based on MV R7170 (Mallee district, C. Frost per J. Frost), data which appears on a number of MV specimens of dubious provenance, including other typhlopids. The record was rejected by Robertson *et al.* (1989) and Coventry & Robertson (1991). The remaining specimen available to Waite (AM R2034, north Queensland) was identified by Shea (1995). Two additional specimens, QM J2953–54 (Stannary Hills, nr Herberton) were potentially available on the basis of registration date, but were either not seen or overlooked by Waite.

*Typhlops diversus*: Waite (1918b) stated that he had examined four specimens, but indicated five localities on his map. Two of these correspond to previous literature records: the type of *Typhlops ammodytes* from the Monte Bello Islands, and two specimens from Noonkambah in the Kimberley reported by Lönnberg & Andersson (1913), the latter based on NHRM 2396–97, which I confirm as *R. diversus*. The type locality, Morven, Qld (given as Mowen by Waite, 1894, but subsequently corrected by Waite, 1918), corresponds to the only Queensland locality mapped, while the remaining two map localities are in the Northern Territory, one in the Darwin area and the other about Tennant

Creek. The latter two records are probably based on SAM R862, (Tennant Creek, J.F. Field) and one of QM J2590–91 (Darwin, G.F. Hill). J2590–91 are misidentified *R. towelli* (K. Aplin, pers. comm.). The fourth specimen, not corresponding to a map locality, is MV R7112 (no data).

*Typhlops endoterus*: Waite (1918b) described this new species from three specimens from Hermannsburg, but gave the number of only the holotype (SAM R88). The two paratypes (SAM R87, R89) were identified by Houston (1976).

*Typhlops grypus*: Waite (1918b), when describing the species, stated that he had four specimens, the type in the Museum of Victoria, the others in the Queensland Museum and South Australian Museum. Of the four, one was from Marble Bar, one was from “Gregory Downs”, and two lacked localities. The holotype (MV R7102, now D12351) lacks locality data. A second MV specimen, R7200 (now D12358), from Marble Bar, was identified as a paratype by Coventry (1970), who noted that correspondence from Waite proved that the specimen was available to him at the time of description. Hence, one of the other two specimens, which are paratypes, must be from “Gregory Downs”, the other lacking locality data, and they must be in the Queensland and South Australian Museums. The only specimen in the latter collection available at the time of Waite's revision is SAM R849, no locality apart from the enigmatic comment “in stomach of spec at Semaphore”, and presented by Dr Wylde. There are four early QM typhlopids with locality “Gregory Downs”: J2944–47. Of these J2945 was destroyed in 1953 without any identification. The remaining three are all *R. grypus*. Only J2947 is annotated as identified by Waite and must be the remaining paratype. Presumably Waite was only sent one of the series.

*Typhlops guentheri*: Waite's map (1918b) has four localities. Three of these correspond to literature records (Daly River; Boulenger, 1895) or early specimen records (AM A4872 [now R150870], QM J2266, Pt Darwin; MV R7073, Oenpelli, East Alligator River) corresponding to the known distribution (Shea & Horner, 1997). The remaining locality is identified as Marble Bar in Waite's description. The record corresponds to WAM R535 (Marble Bar), first registration identification *T. nigricauda*, identified by Waite as *T. guentheri*. This specimen was subsequently reidentified as *R. affinis* by G. Storr (annotation in register), but was not listed by Storr (1981). It was later reidentified as probably *R. grypus* by L. Smith in 1990 but cannot now be found to verify the identification (L. Smith, pers. comm.). The first identification of this species as *T. nigricauda* suggests that the tail was black, and the later identification as *R. affinis* suggests that the snout was at least angulate. These two features suggest that the record is a misidentified *R. grypus*. Four additional specimens (AM R2292 (ex SAM), MV R7111, SAM R802a–b, all no data) are known to have been identified by Waite as *R. guentheri*. Of Waite's *guentheri* records, AM R2292, R150870 and SAM R802b have been subsequently reidentified (Shea & Horner, 1997) as *R. nema*.



*Typhlops kenti*: Waite (1918b) examined four specimens of this species, since synonymised with *R. affinis* (McDowell, 1974): from King's Sound, Broome, "Yanyerreddy" Station (near Ashburton River) and "Western Australia". All are well beyond the known distribution of *R. affinis*. Waite stated that "in three specimens the tail is black, in one other the head is also black". These black markings indicate that Waite's specimens were *R. grypus*, (Parker, 1931, as *T. nigroterminatus*). Two of his records are based on MV R7187 (ex WAM), Rowe, Broome and MM R683, King Sound, both specimens of *R. grypus*. Possibly the "Yanyerreddy" Station record is based on SAM R804, a specimen of *R. grypus* (original identification *T. kenti*) from between the Ashburton and Gascoign [sic] Rivers, 1895, P. St. Barbe-Ayliffe. The remaining poorly localised specimen corresponds to MV R7179 (WA). One additional specimen, WAM R145 (Derby) was present in the WAM collection at the time, but is not identified as examined by Waite, and does not correspond to his listed localities.

*Typhlops labialis*: This species was described by Waite (1918b) from a unique specimen (WAM R630) with locality stated as Western Australia. Although it appears as a valid species in several subsequent publications (Kingham, 1929b, 1956; Glauert, 1950; Worrell, 1963), the name was synonymised with the widespread Asian species *Typhlops diardi* by McDowell (1974). The Western Australian locality is erroneous, as the holotype lacks any associated data (McDowell, 1974).

*Typhlops ligatus*: One specimen mapped from north-west Victoria is well beyond the known range in northern NSW, Qld, NT and the Kimberley (Wells, 1979; Storr, 1981; Swan, 1990; Ingram & Raven, 1991). The source for this record is presumably SAM R921 (ex MV R7167) and MV R7168 (Mallee, Victoria), the latter noted by Rawlinson (1966). A locality in western NSW mapped by Waite, west of localities mapped by Swan (1990) in NSW, is probably based on MM R446 (2 specimens), "Wonaminta", nr Wilcannia, here confirmed as *R. ligatus*. The specimens are juveniles in poor condition, but dorsal scale counts are approximately 317–323 for the two. The Victorian records are from an imprecise locality associated with several other species not subsequently confirmed from the area (*R. broomi*, *R. nigrescens*, *R. pinguis*, *R. proximus*, *R. unguistrois*), and are treated as erroneous. The western New South Wales record, however, although similarly not confirmed by recent material, is from a poorly collected area, and should continue to be treated as valid until evidence to the contrary becomes available.

Six of the remaining seven localities mapped by Waite (1918b), in northern NSW and eastern Qld, correspond to AM R153040 (formerly A10637), Coomooboolaroo, Qld (Waite, 1893); R3970, Brewarrina, NSW; QM J1212, Wycombe, Surat, Qld; J2828, "Lochnagar", Central Railway Line, via Barcaldine, Qld; J2940, Rockhampton, Qld; SAM R197, Buff, Rockhampton, Qld; R850, Niall, "Delta" Stn, Alice, Qld, and the type locality (Mackay), all within the currently known distribution of the species. One other mapped locality, north-west of Brewarrina, cannot be

associated with specimens, unless it is a misplaced Lightning Ridge (AM R6716). To the above-listed specimens can be added the holotype of *Typhlops curtus* (AM R1132), examined by Waite (1893). The type locality (Walsh River) was presumably considered too imprecise to map (Waite, 1918b: 14). Also known to have been seen is MV R7068 (Qld). Three other specimens with imprecise localities were available in collections examined by Waite: AM R153038–39 (formerly 5179, 6405; no locality); QM J2048 (destroyed 1964; probably Qld); J2742 (central Qld); J2941 (destroyed 1965, no locality), although it cannot be confirmed that they were seen by Waite.

Four specimens of appropriate vintage with localities in south-eastern Qld (QM J623, Brisbane, Qld; J624, Dalby, Qld; J2939, Toowong, Brisbane, Qld; SAM R50, Lowood, Qld) do not correspond to localities on Waite's map. The number of localities and variety of sources of these specimens suggest that Waite's map was incomplete in this instance, rather than that he did not see this material.

*Typhlops pinguis*: Waite (1897a) described this species from a single specimen from an unidentified locality in South Australia, the holotype being identified by Waite (1918b) as SAM R803 (registered in 1918; Houston, 1976). Waite (1918b) identified a second specimen from Mallee, Victoria, and mapped four localities in far south-western Australia. The species is now known only from the latter region (Storr, 1981). The Mallee specimen is SAM R922 (previously MV R7166, Mallee, Victoria), while six other early specimens fit three of the four map localities in Western Australia: MV R7173 (ex WAM), Wokalup; SAM R924 (ex WAM R426), Capel; SAM R923 (ex MV R7174, itself ex WAM), WAM R473, Katanning; WAM R590, Kojonup and WAM R624, Wickepin (assuming Wokalup and Capel are represented by a single dot). All but the last specimen were examined and their identity confirmed by Storr (1981). Four other poorly localised specimens were seen by Waite: MV R7175, R7180, R7195, R7201 (all from WA, ex WAM), and two other specimens with the same locality (AM R4976–77, not found) may have been seen by him.

*Typhlops polygrammicus*: Waite's (1918b) concept of *T. polygrammicus* is now known as *R. nigrescens*, following Smith (1927). Waite's distribution map for this species closely approximates the distribution based on modern records (Swan, 1990; Coventry & Robertson, 1991; Ingram & Raven, 1991) except for the two westernmost localities in Victoria and a record from extreme south-east New South Wales. The latter is probably based on SAM R917 (ex AM R1790), Twofold Bay and AM R2295–96 (not found), Bega (R. Etheridge).

Specimens corresponding to localities in the main body of the species' distribution in NSW include AM R905, West Bargo; R1093, R1602, R2027 (not found), R5183, Walcha (R1093 sent to R.M. Bousek in 1925; R1602 now CAS 77814–15); R1521 (not found), Warri, via Braidwood; R1574, R1734 (destroyed 1965), Kempsey; R2412–14, Murwillumbah; R2720, Armidale (now CAS 77816); R4189, Mudgee district; R5975–76, Broughton I.; R6567–70, Tharwa (collected by Waite; R6567 now AMNH 20946;

R6568 not found); R131153, Port Macquarie (formerly 6394); R131170, Mittagong (formerly B9905), and a number of specimens from Sydney suburbs, which are represented by a single dot (Waite, 1918b: 14). It is not possible to unequivocally determine which of the many AM specimens from Sydney listed in the early registers were examined by Waite. However, at least the following Sydney specimens are annotated "examined by Waite 1918": R5, Woolahra; R8, Hunters Hill; R108, Homebush; R398, Randwick; R780, Auburn; R1405, Waverley; R1442, Marrickville; R6554–55, Penrith, while the following additional Sydney region specimens were registered pre-1918 and, in the absence of contrary data, presumably available post-1914 to have been sent to Waite: A8920 (now CAS 77812), R131149 (formerly 5175), R131154–55 (formerly 6398–99), R1311161–62 (formerly A238, A522), Sydney; R625, South Creek, St Mary's; R673 (not found), Riverstone; R674 (not found), Bulli; R1189 (not found), Granville; R1246 (not found), Campbelltown; R1610 (not found), Cabramatta; R1664, N Sydney; R1927, Waverley; R2173 (not found), nr Liverpool; R2301 (destroyed 1965), R3787 (destroyed 1924), Penrith; R2376, Balmain; R2518, Mosman; R2532 (now AMNH 20943), South Head; R3208–10 (only R3209 found), Fairfield; R3655 (now AMNH 20944), Coogee; R3659 (now CAS 77813), Alexandria; R4573, Randwick; R4599, Mosman Bay; R4622, Freshwater; R4816, Bellevue Hill; R5393, Camden; R5971, Lakemba; R131164 (formerly A2813), Smithfield; R131165 (formerly A6386), Woolahra; R131167 (formerly A8924), Kogarah; R131169 (formerly B3704), Field of Mars. Added to these is MM R677, Sydney ("examined ERW").

Nine additional early specimens from NSW which do not correspond to a map dot (AM R911, R1452, MM R678, Richmond River; MV R7096, Clarence River; R7119–23, Macleay River) were presumably excluded because of the imprecise localities (the first is identified in the registers as the basis for the figure of the tail of *T. ruppelli* in Waite, 1893). Conversely, two specimens (R1460, Bendenine; R2719, Salisbury Plains) are annotated as examined by Waite, but do not correspond to map localities, and there are three mapped localities in NSW within the modern range for which corresponding specimens cannot be identified.

Victorian specimens corresponding to Waite's map dots are: MV R3081, Kewell; R7057, Tallangatta; R7059, Mallee; R7074, Alexandra; R7079, R7113, Bright; R7087, Goulburn, and R7090, Tooboorac, although no specimen can be found to correspond with one of the western Victorian localities.

The single Queensland dot, about Brisbane, corresponds to QM J2874, J2884, Tamborine Mtn; J2875, St Helena I., and J2942, Brisbane, of which the first is definitely recorded as examined by Waite.

Other poorly localised specimen known to have been seen by Waite, or available pre-1917 and probably post-1914 are: AM R7 (not found), R90, R126 (not found), R955, R1068 (now SAM R919), R1092 (not found), R1121, R2547–48, R2550–53, R2572, R2577 (not found), R2721, R2728, R3859 (now SAM R918), R6021, R6023–25, R6566, R6571–80 (R6572, R6580 not found), R131150–51 (formerly 5176–77), R131156–58 (formerly 6400, 6402,

6404), MV R7061, R7110, no locality; AM R1229 (not found), R1235, NSW?; R131159–60 (formerly 6407–08), R131163 (formerly A1872), MM R674–76, MV R7081, NSW; R7091, Vic; QM J1931–33 (destroyed or not found 1965), Qld; J1935–36 (destroyed or not found 1965), Qld or NSW; J2049 (destroyed 1964), probably Qld.

One specimen present in early collections, but not mapped or mentioned by Waite, presumably rejected without comment because of its distance from other records if indeed it was seen, is AM R131168 (formerly A10182), Nicol [=Nickol] Bay, WA.

*Typhlops proximus*: This species was described by Waite (1893), who nominated AM 6411 (now R131704), from NSW, as holotype, but noted that he had several specimens available to him. Specimens of *R. proximus* in the Australian Museum registered prior to 1893, and hence available to Waite and potentially paratypes are: 5181 (not found), R95 (now SAM R915, skeletonised), R1115, (exchanged with R.M. Bousek in 1923); R145401 (formerly 5171), R145404 (formerly 6403), R145407 (formerly B2309), no locality; 6415 (exchanged to Baylor University 1905), R145403 (formerly AM 6397), R145405–06 (formerly 6412, 6415), NSW; R615, Richmond; R1028 (not found), Wallinbillan [=Wallanbillan], and R145402 (formerly 6396), West Maitland.

Waite (1918b) maps a relatively continuous distribution in south-eastern Australia, corresponding to the known modern distribution (Swan, 1990; Coventry & Robertson, 1991; Ingram & Raven, 1991), but with three outlying localities, one in north Queensland, one in western NSW and one in north-western Victoria. The north Queensland locality on the map corresponds to the text reference to a distribution south of 17°05'S, and is probably based on the specimen from Malanda (17°22'S) reported by Lönnberg & Andersson (1915). This record is based on NHRM 22456, the identity of which is confirmed as *R. proximus*. Two other specimens are known from the same region (McDowell, 1974: AMNH 27263, Ravenshoe district; AM R148795, 8.2km ESE Ravenshoe, Herberton district), validating this record, although a literature record from further north (Ingram & Raven, 1991, based on J38221, "Silver Plains") is based on a misidentified *R. unguistrostris* (P. Couper, pers. comm.). The Atherton Tableland population appears to be isolated from the main distribution, and may have greater dorsal scale counts (390 for R148795, 392 for NHRM 22456 vs 326–378,  $\bar{x}$  = 349.9, SD = 13.16, n = 62; latter based on AM R1497, R1570, R1845, R2343, R2722, R2724, R2727, R3440, R5764, R6560, R6562, R6564, R7221, R7982, R8440, R8982, R10182, R10437, R10776, R10786, R11498, R11693, R12255, R12307, R12526, R13115, R13448, R13661, R13779, R13830, R13835, R14821, R14946, R15218, R15868, R15936, R17915–16, R18289, R18886, R27304–05, R27313, R30331, R49083, R64294, R66665, R86811, R92391–93, R95270, R95458, R111876, R114565, R118650, R122967, R123430, R128510, R132486, R144603, R144776).

The basis for Waite's western NSW locality, a dot in the vicinity of Tilpa, is not known, as it does not correspond to any identifiable specimen in early collections, unless the



dot represents the Darling River generally (AM R6561, now AMNH 20947, Darling River). The north-western Victorian record is probably based on SAM R922 (Mallee area, Vic), and is probably erroneous, as with other records from this locality.

Other specimens that were available to Waite, and correspond to localities on his map, are, in addition to the localities cited above: AM R1497, R1845, SAM R914 (ex AM R1844), Moree, NSW; AM R1570, R2343, Murrumburrah, NSW; R3440, Manilla, NSW; R5764, Tamworth, NSW; MV R3080, Charlton, Vic; R7067, Macorna, Vic; R7070, Murchison, Vic; R7076, Beulah, Vic; R7082, R7108, R7115, Wangaratta, Vic; R7105, 50mi W Toowoomba, Qld; QM J237 (destroyed), Wondai, Qld; J239, Clayfield, Brisbane, Qld; J362, Woodford, Qld; J1904, Bundaberg, Qld; J2935, Dalby, Qld; J2936, Goodna, Brisbane, Qld; J2937, Glasshouse Mtns, Qld; SAM R200, Mungar Junction, Qld; SAM R916 (ex AM R5690), Budden, Rylstone, NSW. Also seen by Waite (register annotations) are AM R2724, R6560, R6562, R6564, QM J3004, no locality. Three map localities, in the vicinity of Glen Innes, NSW, the north-easternmost NSW locality and the easternmost Victorian locality, cannot be associated with specimens.

Localities for two of the potential paratypes (Richmond and Wallanbilla), together with three MV specimens known to have been examined by Waite (R7077, Moora South, Vic; R7094, Kewell, Vic; R7101, "Nauranny", Murrumbidgee, NSW) do not appear on Waite's map. Wallanbilla, Moora South and "Nauranny" may not have been identifiable by Waite, while he may have confused Richmond with Richmond River, possibly corresponding with the otherwise unreconcilable dot in north-eastern NSW on his map.

Other poorly-localised specimens that may have been seen by Waite are: AM R2727; QM J2938 (destroyed 1965), no locality, and J1934 (destroyed 1965), Qld.

*Typhlops torresianus*: Waite's concept of *torresianus* equates to the species *R. polygrammicus* of most subsequent authors. Queensland Museum records (Ingram & Raven, 1991) and Australian Museum material of this species are solely from north-eastern Queensland, as are the majority of Waite's records. Waite maps one locality in south-eastern Qld. The basis for this record is QM J3006 (Brisbane), original identification *T. torresianus*, current identification *R. polygrammicus*. This species is very similar to *R. nigrescens* (Waite's *T. polygrammicus*), differing primarily in the origin of the nasal cleft (from the first supralabial in *nigrescens*, from the second in *polygrammicus*), and it is possible that the specimen is an aberrant *R. nigrescens*.

Other specimens of *R. polygrammicus* potentially available to Waite or known to have been examined by him, and corresponding to his map localities are: AM R1083, Bellenden Ker Range; R1926 (not found), Ripple Creek, Herbert River; R4691, Dunk I.; MM R685, Cape Grenville (now in very poor condition); MV R7117, Kuranda; QM J2273, Gordonvale and SAM R927 (ex MV R7095), Qld, assuming that R1083, R1926, R7117 and J2273 are represented by a single dot. The remaining mapped locality

is presumably Murray Island, type locality of *T. torresianus*.

Storr (1981: 256) is the only modern author to maintain usage of *R. torresianus* as distinct from *R. polygrammicus* from Timor, and justified his usage by claiming *R. torresianus* has fewer longitudinal scale rows (ventrals "c.350" vs 421–450). Among 12 specimens from north-eastern Australia (AM R1083, R4691, R9614, R10828, R15137, R57282, R57826, R65225, R82599, R98337, R107055, R127404), I find 370–422 dorsal scales, with higher counts predominating in the Cairns region, and lower counts in the drier country on western Cape York. These data suggest that the difference between the two forms is less than previously stated, and geographically variable. Hence, in the absence of a more rigorous study of variation throughout the range, I prefer to treat the two as conspecific.

*Typhlops unguirostris*: Waite had very few records for this species, providing four localities on his map, and noting that he had examined specimens from the type locality (Rockhampton), Darwin, Lyndoch Valley, SA and Mallee, Victoria. The Darwin locality corresponds to the map, and is probably based on AM R4582, Port Darwin. There are two mapped localities in Queensland, one corresponding to Rockhampton (MV R7058), the other to Port Bowen (= Port Clinton), type locality for the synonym *Typhlops curvirostris*. These three localities are within the modern known range of the species in tropical Australia (Storr, 1981; Ingram & Raven, 1991). However, the other two localities are well beyond this distribution. The Lyndoch Valley locality does not appear on Waite's map. The record is undoubtedly based on AM R6581–82 (Lyndoch Valley, SA, Dr Richters, "old collection"). The Mallee, Victoria locality is presumably based on MV R7080 (Rawlinson, 1966). The specimens for both records are identifiable as typical *R. unguirostris* (24 midbody scales, nasal cleft from first supralabial, angulate and strongly-projecting snout, dorsal scales 502, 477, 515 respectively), but are probably incorrectly localised.

One additional specimen, present in the Australian Museum collection from 1894, does not appear to have been used by Waite: AM R1568, Cambridge Gulf (ex QM), unless it was the basis for one of the otherwise unidentifiable *R. wiedii* records from the Kimberley. This specimen is presumably that cited by de Vis (1889). Another specimen, QM J3005, lacking locality data and destroyed in 1965, may also have been available to Waite.

*Typhlops wiedii*: The map provided by Waite (1918b) indicates a much more extensive distribution than that demonstrated by recent studies (Ingram & Raven, 1991; Shea, 1995). Beyond recent limits are two localities in the Kimberley (one about Wyndham, the other about "Theda"), one in Torres Strait, one near the tip of Cape York, one in the vicinity of Cooktown, one about Bowen, four in the south-west of WA about Perth, and one in the Western Australian goldfields.

The Cape York and Torres Strait records are probably based on *R. leucoproctus* (Boulenger, 1893). Waite (1894) had evidently regarded this as a distinct species, but he later listed it as a synonym of *R. wiedii* (Waite, 1918b). The



species was subsequently resurrected by McDowell (1974). Although the two species are superficially similar, they are allopatrically distributed, and are readily differentiated on colour (dark both dorsally and ventrally in *leucoproctus*, pale both dorsally and ventrally in *wiedii*), and have significantly different numbers of dorsal scales (*leucoproctus* 377–394,  $\bar{x}$  = 383.8, SD = 6.30, n = 8, based on AM R4537, R7956, R42661, R48541, R55678, R58961, R59060, R97853; *wiedii* 381–439,  $\bar{x}$  = 417.8, SD = 17.88, n = 10, based on AM R1846, R2001, R2729, R4122, R4544, R5908, R6344, R6563, R6565, R6584; Mann-Whitney U test, U = 75, p = 0.002). Two specimens of *R. leucoproctus* available to Waite, AM R4537, Somerset and MM R679, Darnley I, fit Waite's dots. Another specimen, MM R684, Darnley I., may have been seen by Waite, although there is no record of this with the specimen.

The Cooktown locality is presumably based on MCZ 6487 (Cooktown), identified by Garman (1901) as *R. wiedii*. This specimen was subsequently reidentified (Loveridge, 1934) as *R. affinis*, and by McDowell (1974) as *R. broomi*.

The other odd eastern Australian record, about Bowen, is presumably based on MM R442, Pt Denison (no collector recorded, but probably either George Masters, who collected at this locality for both the Macleay Museum and Australian Museum in 1861/62, or Edward Dämel, who collected at this locality in 1865–66; Fletcher, 1893; Stanbury & Holland, 1988; Tilbrook, 1992). There appears to be no reason to doubt the accuracy of the locality data for this specimen.

The south-west Australian localities are based on misidentified *R. australis*, which share with *R. wiedii* 20 midbody scales and a nasal cleft from the second supralabial and not dividing the nostril. Specimens from south-west WA registered as identified by Waite as *T. wiedii* are: WAM R410, North Jandakot (two of seven specimens originally under this number now SAM R926a–b); R457, Muchea; R507, Mundaring. These records correspond to three of four dots in this area. R457 was not examined by Storr (1981) and is apparently lost. The remaining dot, placed about Perth, is probably based on one or more of the several *R. australis* records from Perth (see above). One additional unlocalised WA specimen of *R. australis* (MV R7198) also bears the Waite identification *T. wiedii*.

The Goldfields record, to the south of Kalgoorlie, and north of Norseman (based on Waite's maps for *australis* and *broomi*) is based on WAM R318, Widgiemooltha, likewise a specimen of *R. australis* (Storr, 1981).

One of the Kimberley records is probably based on WAM R485, Forest River Mission (J.A. Dobson), identified by Waite in the register as *T. wiedii*. This specimen was not examined by Storr (1981), and is apparently lost. However, it is worth noting that two recently described Kimberley species, *R. kimberleyensis* and *R. troglodytes*, share with *R. wiedii* 22 midbody scales and a nasal cleft contacting the second supralabial (Storr, 1981). The source for the other Kimberley record is uncertain, unless it is based on a specimen of *R. unguistrostris* (AM R1568) not otherwise mapped (see above). If this is the case, the error must be considered typographical, as it is not conceivable that Waite would have confused the two very different species.

Waite's other mapped localities for *R. wiedii*, within the modern distribution, are at least partly based on the following specimens: AM R782 (now AMNH 20950), R6586, Yandenbah, NSW; R1441, R3339 (not found), Dubbo, NSW; R1846, Moree, NSW; R2001, Quirindi, NSW; R4122, Clarence River, NSW; R4544, Boggabri, NSW; R5908, R6344, QM J2197–98, Eidsvold, Qld; MV R7097, Grafton, NSW; MV R7107, Pine River, Qld; QM J171, J2087, J2949, Brisbane, Qld; J890–91, Enoggera, Brisbane, Qld; J1235 (destroyed 1964), Booval, Ipswich, Qld; J2130–32, Corinda, Brisbane, Qld; J2432–33, 17 Mile Rocks, Brisbane, Qld, and J2948, Breakfast Ck, Hamilton, Qld, assuming the latter seven localities and the type locality (Brisbane) are represented by a single dot.

Other specimens that were or may have been seen by Waite, but are not mapped, are AM R1453 (currently 12 specimens, but some destroyed 1914), Darling River floods, NSW; R1596, Qld; R2729, R6563, R6565, R6584, R6587–88, MV R7144–46, QM J2445 (destroyed 1953), no locality; AM R3600, Koorawatha, NSW (registration entry notes "identified by Waite 1918"); MM R680–81 (5 specimens), Tamworth, NSW; QM J2045–47, J2059–60 (all five destroyed 1964), probably Qld; J2115, Oakey, Qld; J2730–31 (latter specimen exchanged to PNM), Pittsworth, Pampas, Qld; J2920–2921, Bowenville district, Qld. The lack of a dot in the Darling Downs on Waite's map, despite records from the latter three localities, probably represents an error on Waite's part.

Non-Australian species. Although Waite primarily worked on the Australian typhlopids fauna, he described two non-Australian species (*Typhlops subocularis* Waite, 1897b, and *Typhlops infralabialis* Waite, 1918a, both now in *Acutotyphlops*; Wallach, 1995) and reported typhlopids from Fiji (Waite, 1898). The holotypes of both new species were re-described by Wallach (1995) who, following Cogger (1979), reported that the paratype of the former species was missing. I also have been unable to locate AM R2203, identified as the paratype by register entry. However, R2169 (no locality, E. Sutton), a specimen of the same species, accurately fits the measurements provided by Waite (1897b) for the paratype and may be the missing specimen with the wrong tag attached.

Wallach (1996) could not determine the basis for Waite's Fijian typhlopids record. Register entries for AM 6428–30 state "*Typhlops* nov. sp. Wai Obi, Vanua Pi, Fiji, Mr J. Johnston, Fiji". Additionally "(Naota)" is entered against 6430. These data correspond to those presented by Waite (1898). Unfortunately, 6428 is further annotated as destroyed 1914, and the other two specimens cannot be found, and may have shared the same fate.

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